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A New Subspecies of the Mexican Moccasin, *Agkistrodon bilineatus* *

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Two specimens of *Agkistrodon bilineatus* Günther from northeastern Mexico represent a distinct subspecies for which no name has yet been proposed. The localities where these specimens were collected are in a semi-arid area covered with desert shrub vegetation, as contrasted to the humid, lowland jungle where *A. bilineatus* is usually found. The nearest locality records for typical *A. bilineatus* are several hundred miles distant from those known for the new subspecies.

Our attention was first called to this interesting situation by Dr. Edward H. Taylor, who collected the specimen which we have designated holotype of the new subspecies, and to whom we are indebted for permission to study it and other specimens of the species in his collection. For advice and assistance, including the loan of specimens, we wish in addition to thank Dr. Howard K. Gloyd, Dr. Hobart M. Smith, and Mr. Clifford H. Pope.

We have used Gloyd and Conant's (1943) scheme of description of races of *Agkistrodon contortrix* as a model for the following description.

Agkistrodon bilineatus taylori new subspecies†

Agkistrodon bilineatus Taylor, Univ. Kansas Sci. Bull., vol. 26, no. 14, 1940, p. 486.—Schmidt and Owens, Zool. Ser. Field Mus. Nat. Hist., vol. 29, no. 6, 1944, p. 113.

Holotype.—E. H. Taylor Collection No. 5514, a young male from km. 833, 21 kilometers north of Villagrán, Tamaulipas, collected alive by Edward H. Taylor on June 9, 1938, on the highway pavement about dark. *Paratype.*—Chicago Natural History Museum No.

* Contribution from the Museum of Natural History and the Department of Zoology, University of Illinois, Urbana, Illinois.

† Named for Dr. Edward H. Taylor in recognition of his many contributions to our knowledge of the Mexican herpetofauna.

28794, adult male from south of Linares in the region of the boundary between the state of Tamaulipas and Nuevo Léon, Mexico.‡ The exact locality is unknown but undoubtedly is no more than a few miles from the type locality.

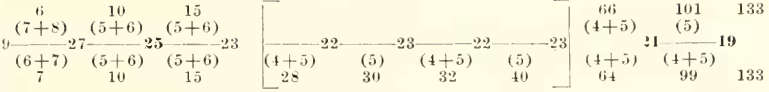
Diagnosis.—This subspecies differs from *Agkistrodon bilineatus bilineatus* in the following respects: (1) lower light line on side of head not bordered below by a dark line posterior to the second supralabial; (2) fewer subcaudals, 51-54 in males; and (3) a pattern of dorsal crossbands which remains distinct in adults.

Description of holotype.—Head shields arranged as in *Agkistrodon bilineatus bilineatus*: paired and bilaterally symmetrical internasals, prefrontals, supraoculars, and parietals, and a single rostral and frontal; posterior border of parietals irregular and broken by several sutures which extend a short distance anteriorly. Nasals 2, the anterior large and crescent-shaped, the posterior smaller and approximately square with much rounded corners. Loreal about as long as high, smaller than upper preocular and about the same size as posterior nasal. Three preoculars, the uppermost larger, the middle one forming the upper and posterior borders of pit, and the lowermost very small. Separated from orbit by the last is an elongate scale which forms the lower border of pit. One large subocular and two postoculars. Supralabials 8, the first smaller, irregularly quadrangular, and lying entirely below anterior nasal; the second larger and elongated upward to form anterior border of pit; the third, fourth, fifth, sixth, and seventh largest and about equal in size; the posterior part of third and most of fourth beneath eye; the eighth shorter than others. Infralabials 11 on each side, the anterior pair meeting immediately posterior to mental. Temporals irregular, 4 to 6 in each vertical row. A single pair of enlarged chinshields followed by four pairs of scales, the last which is separated from the labials by 4 longitudinal rows of scales on each side.

Dorsal scales keeled on the back, the keels reduced on the sides and absent from the lower two rows on each side; scale rows odd in number, progressively reducing bilaterally toward the tail as follows:¶

‡ Due to an error in the museum catalogue, locality data for the latter specimen was erroneously recorded by Gloyd and Conant (1943); but the record was subsequently corrected by Schmidt and Owens (1944).

¶ In the following scale count formula the Clark and Inger recount system (1942) is used with several modifications. Changes of an anomalous nature are enclosed in brackets and the number of rows covering the loci where the usual three counts are made are printed in bold-faced type. In a number of specimens the anterior and mid-body counts are the same (this is the case in all instances where only two numbers are in bold-faced type). An abbreviated formula omitting the number of the scale rows involved in each change is used for all except the holotype and paratype.



The ventrals are 133; subcaudals 54, the last 19 divided. The anal is entire but has the posterior left corner almost cut off by a suture extending from the left anterior corner toward the middle of the posterior edge. Terminal spine short and blunt, scarcely protruding beyond the last pair of subcaudals. The snout-vent length is 383 mm. and the tail length, 82 mm.

"Head grayish-black above, more grayish on the sides of head and chin; a yellowish-white line from tip of snout along the canthus rostralis to angle of the jaw, where it joins a line originating on the anterior nasal which runs across the labials and across angle of the jaw; below the white line on labials, the lip is edged with amber-orange; a vertical stripe on rostral which is white with amber-orange center; this connects, when mouth is closed, with a stripe extending back from mental to the posterior chinshields and then bifurcates, the lines continuing back to first widened ventral. The lines are here joined by another white line; two amber-orange lines extend from sixth lower labial diagonally to the bifurcating lines.

"Body generally lavender gray, traversed by lighter gray, irregular, saddle-like blotches, with interrupted amber-orange borders, which join and form a large amber-orange spot low on side; intervening areas may be divided by a very dim medial band, which joins a black, light-edged spot on the ventrals. Belly generally dark with amber-orange spots and reticulations. Tail yellow-green." §

Dark dorsal crossbands 12 in number on the body, the first continuous with the darker portions of the head, the last extending onto the base of the tail, all wide and slightly constricted medially, averaging 10 scales in width on the sides and 8 at the midline. Each anterior and posterior border of the bands fuses with a lateral belly spot. Each band has a slightly lighter median band across the center which expands on the sides to enclose a third lateral ventral spot for each band. This middle lateral spot is usually more extensive than the others, reaching to or beyond the middle of the ventrals and often joining the corresponding spot of the opposite side. Posteriorly the dark ventral coloring becomes extensive and all of the lateral ventral spots tend to be connected. The dark brown ver-

§ Color of the holotype in life, quoted from Taylor (1940, p. 486).

tical band on each side of the light rostral stripe extends posteriorly along the upper lip only to the middle of the second supralabial.

Variation.—The two specimens of *taylori*,° the holotype and paratype, agree closely in coloration and scutellation. The lower light head stripe of the paratype has a dark border only on the first and adjacent third of the second supralabial on the left and on the first supralabial on the right. The dorsal crossbands are distinct, as in the holotype, but slightly narrower averaging 9 scales wide on the sides and 7 scales at the midline. Ventrals are 133 in number, caudals 51, snout-vent length 553 mm., tail length 125 mm., supralabials 8, infralabials 10. The dorsal scale rows are as follows:

11	14	85	106	133
(7+8)	(6+7)	(4+5)	(5)	
27——25——23——21——19				
(7+8)	(6+7)	(4+5)	(5)	
11	11	77	106	133

Discussion.—The two specimens of this subspecies were compared with ten specimens of the typical subspecies from the following localities:|| MEXICO: no definite locality (CNHM 42147, CNHM 56376); *Colima:* no definite locality (CAS 5253), Tecoman (CAS 11333); *Michoacán:* Apatzingan (CNHM 39093), El Sabino, Uruapan (EHT-HMS 5357); *Oaxaca:* Rincón Bamba (EHT-HMS 28019); *Yucatán:* Libre Unión (CNHM 36253), Mérida (CNHM 19425). BRITISH HONDURAS: Belize (CNHM 4196). In addition the summary of the data for 46 specimens of *bilineatus* given by Gloyd and Conant (1943, p. 168) proved very useful.

The dark lower border of the lower head stripe in all of the specimens of *bilineatus* which we have examined extends to at least the sixth supralabial and usually to the seventh or eighth supralabial. This is in marked contrast to the condition in *taylori* in which the dark border does not extend beyond the middle of the second supralabial (see pl. 25).

With one exception the numbers of ventrals and caudals in these specimens of *bilineatus* fall within the ranges given by Gloyd and Conant (1943, p. 168). The numbers of subcaudals of the two males of *taylori*, 54 and 51, fall well below the range in number of subcaudals of male *bilineatus* (59-68). The exception mentioned above, a male *bilineatus* (CNHM 39093) with 69 subcaudals, extends this

° Hereafter the single names *taylori* or *bilineatus* refer to the subspecies unless otherwise indicated.

|| The following abbreviations are used for the collections from which specimens were examined: Chicago Academy of Sciences (CAS), Chicago Natural History Museum (CNHM), Edward H. Taylor-Hobart M. Smith Collection (EHT-HMS).

range slightly. The number of ventrals in both specimens of *taylori*, 133, is well within the range of variation of male *bilineatus*.

In adult *bilineatus* the dorsal crossbands exhibited by juveniles are obscured by the general darkening of the ground color (see Gloyd and Conant, 1943, fig. 11). The dark adult coloration is acquired in this subspecies at a rather small size, probably during the second or third year. A male of *bilineatus* (CNHM 1133), 587 mm. in snout-vent length, shows the typical melanistic coloration. In contrast *taylori* retains distinct cross bands for a longer time, possibly throughout life (see pl. 25). The crossbands of the paratype, with a snout-vent length of 553 mm., are distinct with no indication of becoming obscured. For this reason the color pattern of *A. b. taylori* bears a general resemblance to that of *A. contortrix pictigaster* and of juvenile *A. piscivorus leucostoma*, the geographic ranges of both of which it closely approaches (see Gloyd and Conant, 1943, figs. 10, 13). These three forms also show convergence in number of subcaudals. The exact phylogenetic significance of these trends is not certain. However, it seems very unlikely that the species *bilineatus* through its subspecies *taylori* will be found to intergrade with either the copperhead or cottonmouth.

The specimens available to us do not indicate any subspecific difference in proportionate tail length. Measurements of larger series of both subspecies would be required, as ontogenetic changes in proportionate tail length are obviously involved. Similarly no subspecific differences could be found in the number of dorsal scale rows. To illustrate the variation several abbreviated scale row formulae of *bilineatus* are given below:

CNHM 36258	♀	27	9	25	13	23	91	21	120	19	138
			9		14		89		114		138
CNHM 39093	♂	27	11	25	14	23	84	21	96	19	132
			10		15		85		97		132
EHT-HMS 28019	♂	27	12	25	23	23	105	21		20	132
			15		17		104		133		132

If the variation in the location of each scale row reduction is noted, no definite difference is apparent between *bilineatus* and *taylori* (see Table 1). The average point of each scale row reduction may be found to be more posterior in *bilineatus* when larger series of each subspecies are examined.

TABLE I.—Ordinal Number of Ventral Where Each Dorsal Scale Row Reduction Occurs *

Subspecies	Scale Row Reduction			
	27 ⇒ 25	25 ⇒ 23	23 ⇒ 21	21 ⇒ 19
A. b. taylori	10–11	11–15	64–85	99–106
A. b. bilineatus	9–15	13–23	84–105	96–133†

* Based on only 2 specimens of *taylori* (both males) and three of *bilineatus* (2 males and 1 female).

† In one specimen no last reduction occurred anterior to the anus on one side.

In the three characteristics mentioned in the diagnosis, *taylori* is apparently completely distinct. Its affinity with *A. bilineatus* is, however, unmistakable. Future collecting will probably reveal intergading populations somewhere in the Atlantic coastal plain between central Tamaulipas and Yucatán. Even in the event that such intergrades fail to appear, we feel that the relatively minor nature of the differences between *taylori* and *bilineatus* indicate existence of a subspecific relationship between them. We are in accord with Mayr's (1947, p. 166-167) opinion that, in the case of forms not known to occur together, the degree of morphological difference associated with reproductive isolation in forms of the same group known to be species should be applied as a yardstick to determine whether the forms in question are best to be considered as species or subspecies. Only in the event that actual overlap without intergradation was found to occur would one be justified in considering *taylori* a distinct species.

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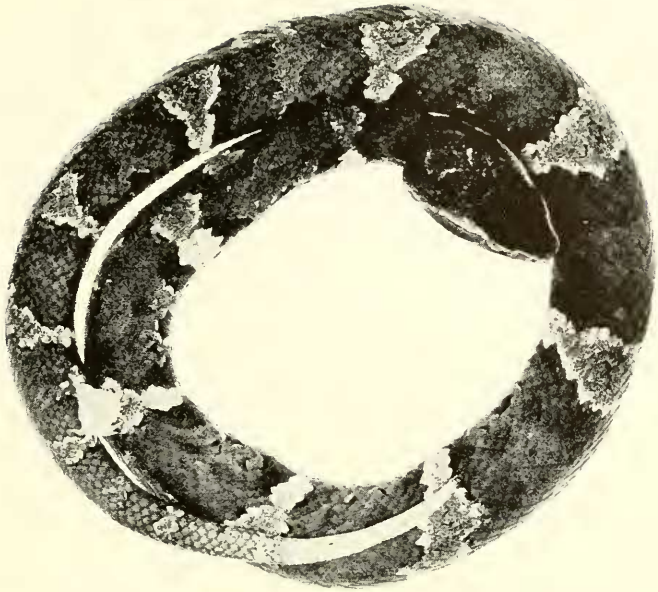

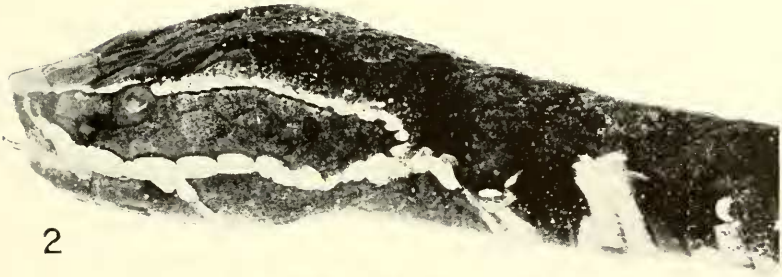

PLATE XXV. FIG. 1. Dorsal view of the holotype of *Agkistrodon bilineatus taylori* subsp. nov. Total 678 mm. E.H.T.-H.M.S. No. 5514. FIG. 2. Lateral view of head of holotype of *A. b. taylori* (enlarged). FIG. 3. Lateral view of head of *Agkistrodon bilineatus bilineatus*, E.H.T.-H.M.S. from El Sabino, Uruapan, Michoacán.